a1 concl.

from each other and each is movable in two-dimensional directions by a reaction force produced as the movable portion is driven. --

IN THE SPECIFICATION:

Please amend the specification as follows:

Please substitute the paragraph beginning at page 1, line 5, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a2

-- This invention relates to a moving mechanism suitably usable in a high precision process such as a semiconductor lithographic process, for example, and a stage system having such a mechanism or an exposure apparatus having such a stage system. --

Please substitute the paragraph beginning at page 1, line 10, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a3

-- The manufacture of semiconductor devices or the like uses an exposure apparatus of a step-and-repeat type (called a stepper) in which a pattern of an original (reticle or mask) is sequentially printed on different exposure regions on a substrate (wafer or glass plate) through a projection optical system while moving the substrate stepwise. An alternative is a step-and-scan type exposure apparatus (called a scanner) in which stepwise motion and scanning exposure are repeated so that the printing exposure is repeated to plural regions on a substrate. Particularly, the step-and-scan type uses a portion of the projection optical system which is relatively close to

a3
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its optical axis and, therefore, it enables high precision and wide view angle exposure of a fine pattern. --

Please substitute the paragraph beginning at page 2, line 10, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a4

-- Many proposals have been made to solve such a problem. Examples are U.S. Patent Nos. 5,260,580, 5,684,856 and 6,072,183, showing systems in which a stator of a linear motor for moving a stage is supported by a floor, independently of a stage base table, thereby to prevent swinging motion of the stage base table due to a reaction force. U.S. Patent No. 5,172,160 shows a system in which, to a machine frame for supporting a wafer stage and a projection lens, a force actuator for producing a force in a horizontal direction is used to apply a compensating force equivalent to a reaction force caused in response to the stage motion, thereby to reduce the swinging motion of the system by the reaction force. --

Please substitute the paragraph beginning at page 2, line 24, and ending on page 3, line 10, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a5

-- In these examples, however, although the swinging motion itself of the stage system can be reduced, the reaction force responsive to the stage motion is transmitted directly to the floor or to the floor via a member which can be regarded as being substantially the floor. As a result, the floor is vibrated, which then causes vibration of a peripheral apparatus adjacent to the

A5 concl.

exposure apparatus. Generally, the floor on which an exposure apparatus is disposed has a natural vibration frequency of about 20 - 40 Hz. If the natural frequency of the floor is excited in response to the operation of the exposure apparatus, it causes large adverse influences to peripheral equipment. --

Please substitute the paragraph beginning at page 3, line 11, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A6

-- The stage acceleration is becoming larger and larger due to increases of the processing speed (throughput). For a step-and-scan type exposure apparatus, for example, the largest acceleration of a stage reaches 4G (for a reticle stage) or 1G (for a wafer stage). Further, the mass of the stage is becoming bulky, due to increases in size of a reticle or a substrate. For these reasons, a driving force that can be defined by "the mass of a moving element" as multiplied by "the acceleration" becomes very large and, therefore, the reaction force thereof is enormous. Thus, the reaction force becomes large with the increase of acceleration and weight, and vibration of the floor due to the reaction force cannot be disregarded. --

Please substitute the paragraph beginning at page 4, line 14, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A7

-- The resolving power of an exposure apparatus can be improved by making the exposure wavelength shorter or by enlarging the numerical aperture (NA) of a projection optical system. --

Please substitute the paragraph beginning at page 4, line 25, and ending on page 5, line 14, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a8

-- In relation to deep ultraviolet light, more particularly, ArF excimer lasers having a wavelength near 193 nm or F_2 excimer lasers having a wavelength near 157 nm, it is known that there are plural oxygen (O_2) absorption bands in zones close to these wavelengths. As regards fluorine excimer lasers, for example, because of the short wavelength of 157 nm, the application of it to an exposure apparatus has been attempted. However, the wavelength of 157 nm is in the wavelength region generally called vacuum ultraviolet. In this wavelength region, the absorption of light by oxygen molecules is large and, therefore, the atmosphere does not transmit most of the light. For this reason, it can be applied only in an environment in which the pressure is reduced close to vacuum and the oxygen density is made sufficiently low. --

Please substitute the paragraph beginning at page 5, line 15, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a9

-- Further, the absorption of light by oxygen results in production of ozone (O_3) which in turn functions to strengthen the absorption of light. Therefore, the transmission factor becomes very low. Additionally, various products attributable to the ozone are deposited on the surfaces of optical elements, causing a decrease of the efficiency of the optical system. --

Please substitute the paragraph beginning at page 7, line 18, and ending on page 8, line 3, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A10

-- It is a further object of the present invention to provide an exposure apparatus which uses ultraviolet light, more particularly, ArF excimer laser light or F_2 excimer laser light, wherein, because the absorption of the ArF excimer laser light or F_2 excimer laser light by oxygen or water content is very large, the oxygen concentration or water concentration must be lowered to attain a sufficient transmission factor and a good stability of ultraviolet light. The present invention concerns development of effective purge means in relation to a wafer and/or a reticle, which moves along the path of ultraviolet light inside the exposure apparatus. --

Please substitute the paragraph beginning at page 11, line 5, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A11

-- The left-hand and right-hand stators 1 and 1′ receive a drive reaction force of the force which functions to move the moving unit 3 as a whole, including the movable element 2. With this drive reaction force, the stators 1 and 1′ displace along the plane guide surface 6. Through this motion of the stators 1 and 1′ along the plane guide surface 6, the stators 1 and 1′ can function as a reaction force counter. In this embodiment, if, for example, the moving unit 3 as a whole moves in the positive (+) Y direction, the stators 1 and 1′ receive a drive reaction force in the negative (-) Y direction and thus they shift in the negative Y direction. --

Please substitute the paragraph beginning at page 13, line 7, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A12

-- Further, in accordance with this embodiment, the left-hand and right-hand stators 1 and 1′ are provided independently from each other. As a result, even if the left-hand and right-hand electromagnetic actuators produce different outputs, these stators are moved separately to cancel the reaction force. The left-hand and right-hand actuators may produce such different outputs, for example, in a case where the moving member should be rotationally moved in a θ direction, or a case where an article placed on the moving member has a biased load with respect to the X direction, for example. --

Please substitute the paragraph beginning at page 13, line 19, and ending on page 14, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A13

-- Although this embodiment has been described with reference to an example wherein the electromagnetic actuator moves the moving member in the Y direction, the present invention is not limited to this. For example, the moving member may be moved in the X and Y directions. On that occasion, the electromagnetic actuator may preferably comprise a mechanism for producing a driving force in the X and Y directions and applying the same to the moving member. Also, on that occasion, the stators 1 and 1′ may be supported by the static bearing 9 with respect to the plane guide surface 6, and movably in the X and Y directions. --

Please substitute the paragraph beginning at page 21, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a14

-- In this embodiment, for the stators 1 and 1′, two Y-axis position controlling linear motors 14 are provided on an external structure 23, and they function to push back the stators 1 and 1′ as they move in the Y-axis direction by an amount larger than a predetermined amount. Similarly, for the stators 1 and 1′, there are four X-axis position controlling linear motors 15 which are mounted on the external structure 23, to push back the stators 1 and 1′ as they move in the X-axis direction by an amount greater than a predetermined amount. --

Please substitute the paragraph beginning at page 22, line 13, and ending on page 23, line 15, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a15

-- In Figures 4A and 4B, a top plate 5 is provided with a wafer chuck 30 and a position measuring bar 50. The wafer chuck 30 serves to vacuum attract a wafer (the subject to be positioned) and hold the same. Bar mirrors 50 and 51 reflect measurement light from a laser interferometer, not shown. The top plate 5 is floated from and X-Y slider 38, by means of a self-weight compensator (not shown) using a magnet, without contact to the slider, and it has a freedom with respect to six-axis directions. Further, the top plate 5 can be minutely driven in six-axis directions (X, Y, and Z directions as well as rotational directions about them), by means of an actuator for producing a driving force between the top plate 5 and the X-Y slider 38. The six-axis fine motion actuator comprises two linear motors in the X direction, one linear motor in

A15 Concl. the Y direction, and three linear motors in the Z direction. When the two X-direction fine motion linear motors are driven in opposite directions, the top plate can be moved about the Z-axis (i.e., in the θ direction). Thus, by adjusting the driving forces of the three Z-direction fine motion linear motors, the top plate can be moved about the X-axis (wX direction) and about the Y-axis (wY axis direction), respectively. Further, the coil which serves as a stator of the fine-motion linear motor is provided at the X-Y slider 38 side, while the permanent magnet which serves as a movable element of the fine-motion linear motor is provided at the top plate side. --

Please substitute the paragraph beginning at page 23, line 25, and ending on page 24, line 10, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A16 -- Adjacent to the opposite ends of the X-guide bar 28 and the Y guide bar 29, there are movable elements (magnets) 26 and 27 of the linear motors. In response to the flow of electric current to the two X and Y linear motor stators (coils), a Lorentz force is produced, such that the X guide bar 28 can be moved in the Y direction while the Y guide bar 29 can be moved in the X direction. The linear motor stators (coils) 24 and 25 are guided along the top surface of the reference structure 4, by means of an air bearing (static pressure bearing), with respect to the Z direction, and they have a freedom with respect to the X and Y directions (along a plane). --

Please substitute the paragraph beginning at page 24, line 11, and ending on page 25, line 7, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A47

-- Now, the motion of the X-Y slider 38 in the X direction will be explained. When the Y guide bar is moved in the X direction by the Lorentz force described above, a force in the X direction is applied to the X-Y slider 38 through the static bearing 35. Here, the X-Y slider and the Y guide bar will be called an X movable unit. When the X movable unit is accelerated or decelerated, a reaction force thereof is applied to the X linear motor stator 25. Since the X linear motor stator 25 is supported by the static bearing 34, movably in the X and Y directions, due to this reaction force, the X linear motor stator 25 moves in the X direction. The acceleration and speed of the motion is determined by the ratio between the mass of the X linear motor stator 25 and the mass of the X movable unit. For example, if the mass of the X linear motor stator 25 is 200 Kg per each while the mass of the X movable unit is 40 Kg, the ratio of the mass is 10:1. Therefore, both the acceleration and speed of the X linear motor 21 is one-tenth (1/10) of the X movable unit. In this manner, through the motion of the X linear motor stator 25 in the X direction, in the reference structure, no X-direction reaction force is applied to the X linear motor stator 25. --

Please substitute the paragraph beginning at page 26, line 10, and ending on page 27, line 7, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a18

In this embodiment, since the X-Y slider is movable in the X and Y directions, the driving force to be produced by the linear motor is different in accordance with the position of the X-Y slider. For example, if in Figure 4A the X-Y slider 38 moves in the positive (+) Y direction and thereafter it moves in the positive (+) X direction , since the X-Y slider as it moves in the positive X direction is on the side close to the positive Y direction, only the driving force as produced by the upper X linear motor, as viewed in the drawing, is larger than the driving force of the lower X linear motor, as viewed in the drawing. This is because, if on such an occasion the outputs of these X linear motors are the same, a moment in the θ direction will be applied to the X-Y slider 38. If the stators are connected to each other into an integral structure, depending on the position of the X-Y slider, a moment in the θ direction may be applied when the drive reaction force is being canceled. In this embodiment, even if the driving forces of the linear motors are different, since the linear motor stators are supported independently from the reference structure, while being movable in the X and Y directions, each stator can function to cancel the drive reaction force, independently of each other. --

Please substitute the paragraph beginning at page 28, line 20, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a19

-- The exposure light may be ultraviolet light such as from a fluorine excimer laser, an ArF excimer laser and a KrF excimer laser, for example. --

Please substitute the paragraph beginning at page 29, line 5, and ending on page 30, line 3, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A20

-- When the electromagnetic actuator comprises a linear motor having a movable element and a stator, the movable element and the stator may have a telescopic structure such as shown in Figure 6A or an open structure such as shown in Figure 6B. In Figures 6A and 6B, there are electromagnetic actuators each having a movable element 2 and left-hand and right-hand stators 1 and 1′, being separated and independent from each other. Here, the left-hand and right-hand stators 1 and 1′ function also as a reaction force counter having a predetermined weight. They are movable along the plane guide surface 6 on the reference structure 4. In the case of a telescopic structure such as shown in Figure 6A, the stators 1 and 1′ are supported at the opposite ends of the straight direction. At the opposite ends, they can move freely along the plane guide surface 6 of the straight direction. At the opposite ends, they can move freely along the plane guide surface 6 of the reference structure 4. The movable element 2 is connected to a moving unit 3 being movable in parallel to the plane guide surface by the moving element 2. A top plate 5, for example, may be provided on the movable unit 3, so that an article to be moved can be placed there. On the other hand, when an open structure such as shown in Figure 6B is used, the structure and function will be the same as has been described with reference to the first embodiment. --

Please substitute the paragraph beginning at page 30, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a21

-- Ordinary moving systems, X-Y stages and exposure apparatuses may use any one of the telescopic structure and the open structure. However, as described, in an exposure apparatus using ultraviolet light as the exposure light, oxygen and water content along the path of ultraviolet light must be purged completely. --

Please substitute the paragraph beginning at page 30, line 11, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a22

-- Figures 7A and 7B show an exposure apparatus according to an embodiment of the present invention, in which the relationship between a stator and a movable element of a linear motor in an X-Y stage is based on an open structure, to a telescopic structure. There is a shielding wall provided inside the stator, and it extends from an illumination optical system to an end face of a substrate structure which serves also as a projection optical system, including a movable unit on which a reticle is placed. The inside space of this wall is purged by using an inactive gas. --

Please substitute the paragraph beginning at page 31, line 20, and ending on page 32, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A23

-- As shown in Figure 7B, there is a shielding wall 53 for covering the movable element 2, the movable element 3, the top plate 5, the reticle 52 as well as the mirrors, bar mirrors and detectors which constitute an interferometer. The shielding wall 53 extends from the illumination optical system 54 to an end face of a substrate structure, which functions also as the projection optical system 55. Particularly, the stators 1 and 1′ have an open structure, not a telescopic structure. The inside space of the shielding wall is purged by an inactive gas, against impurities. --

Please substitute the paragraph beginning at page 32, line 5, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A24

-- In this manner, the relation between the stator and the movable element of the linear motor for the stage is based on an open type structure, and a shielding wall is provided between the stator and the movable element. Also, the inside space is purged against impurities, by using an inactive gas. As a result, even if fluorine laser light is used, the transmission factor is not attenuated by oxygen or water, and a good stability of it is assured. Further, the purge space around a reticle can be made compact, and the replacing time of inactive gas can be made short. Moreover, because the stator is outside the purge space, it is not influenced by degassing from the stator. --

Please substitute the paragraph beginning at page 32, line 19, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a25 -- While this embodiment has been described with reference to a one-axis drive reticle stage, the reticle stage may be made movable in the X-axis direction about a movable element, thereby to provide an X-Y stage. Further, a θ-Z tilt stage may be mounted to provide a six-axis movable wafer stage. --

Please substitute the paragraph beginning at page 32, line 27, and ending on page 33, line 10, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a26 -- Next, an embodiment of a manufacturing system for manufacturing semiconductor devices such as semiconductor chips (e.g., IC or LSI), liquid crystal panels, CCDs, thin film magnetic heads, or micro-machines, for example, will be described. This system is arranged so that repair of any disorder occurring in a production machine placed in a semiconductor manufacturing factory or periodic maintenance thereof or, alternatively, maintenance services such as software supply, can be made by use of a computer network outside the manufacturing factory. --

Please substitute the paragraph beginning at page 33, line 11, and ending on page 34, line 5, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a27 -- Figure 8 is a schematic view of a general structure of the production system, in a certain aspect thereof. Denoted in the drawing at 101 is a business office of a vendor (machine

A27
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supplying maker) for providing semiconductor device manufacturing apparatuses. As examples of such production machines, here, pre-process machines (various lithographic apparatuses such as an exposure apparatus, a resist coating apparatus, an etching apparatus, for example, as well as a heat treatment apparatus, a film forming apparatus, and a flattening apparatus) and post-process machines (an assembling machine and an inspection machine, for example) are assumed. Inside the business office 101, there are a host control system 108 for providing a maintenance database for the production machines, plural operating terminal computers 110, and a local area network (LAN) 109 for connecting them to constitute an intranet. The host control system 108 is provided with a gateway for connecting the LAN 109 to an internet 105 which is an outside network of the office, and a security function for restricting the access from the outside. --

Please substitute the paragraph beginning at page 34, line 6, and ending on page 35, line 22, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A28

-- On the other hand, denoted at 102 - 104 are plural manufacturing factories of a semiconductor manufacturer or manufacturers as a user (users) of production machines. The factories 102 - 104 may be those which belong to different manufacturers or to the same manufacturer (e.g., they may be a pre-process factory and a post-process factory). In each of the factories 102 - 104, there are production machines 106, a local area network (LAN) 111 for connecting them to constitute an intranet, and a host control system 107 as a monitoring system for monitoring the state of operation of the production machines 106. The host control system

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107 in each factory 102 - 104 is provided with a gateway for connecting the LAN 111 in the factory to the internet 105 which is an outside network of the factory. With this structure, the host control system 108 of the vendor 101 can be accessed from the LAN 111 in each factory, through the internet 105. Further, due to the security function of the host control system 108, only admitted users can gain access thereto. More specifically, through the internet 105, status information representing the state of operation of the production machines 106 (for example, the state of the machine in which any disorder has occurred) may be transmitted as a notice from the factory to the vendor. Additionally, any response information which is responsive to the notice (that is, for example, information on how the disorder should be treated or software data concerning the treatment) as well as a latest software program and maintenance information such as help information, may be supplied from the vendor. The data communication between each factory 102 - 104 and the vendor 101 as well as the data communication through the LAN 111 in each factory, may use a communication protocol (TCP/IP) generally used in the internet. In the place of using the internet, an exclusive line network (e.g., ISDN) controlled with strictest security that access by a third party is not allowed, may be used. Further, the host control system is not limited to the system as provided by the vendor. A database may be structured by the user and it may be set in an outside network, such that is can be accessed from plural user factories. --

Please substitute the paragraph beginning at page 37, line 23, and ending on page 38, line 25, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A29

-- Each of the production machines in the factory may have a display, a network interface and a computer for executing network accessing software, stored in a storage device, as well as machine operating software. The storage device may be an internal memory or a hard disk or, alternatively, it may be a network file server. The network accessing software may include an exclusive or wide-use web browser, and a user screen interface such as shown in Figure 10, for example, may be provided on the display. Various data may be inputted into the computer (input zones on the screen) by an operator who controls the production machines in each factory, such as, for example, machine type (401), serial number (402), trouble file name (403), date of disorder (404), emergency level (405), status (406), solution or treatment (407), and progress (408). The thus inputted information is transmitted to the maintenance database through the internet. In response, appropriate maintenance information is replied from the maintenance database to the user's display. Further, the user interface as provided by the web browser enables a hyperlink function (410 - 412) as illustrated. As a result, the operator can access further details of information in each item, or he/she can get a latest version software to be used for the production machine, from the software library as provided by the vendor. Alternatively, the operator can get an operation guide (help information) prepared for factory operators. --

Please substitute the paragraph beginning at page 39, line 2, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

-- Figure 12 is a flow chart of a general procedure for the manufacture of microdevices. --

A30

Please substitute the paragraph beginning at page 39, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A31

-- Step 1 is a design process for designing a circuit of a semiconductor device. Step 2 is a process for making a mask on the basis of the circuit pattern design. Step 3 is a process for preparing a wafer by using a material such as silicon. Step 4 is a wafer process (called a pre-process) wherein, by using the so prepared mask and wafer, circuits are practically formed on the wafer through lithography. Step 5 subsequent to this is an assembling step (called a post-process) wherein the wafer having been processed by step 4 is formed into semiconductor chips. This step includes an assembling (dicing and bonding) process and a packaging (chip sealing) process. Step 6 is an inspection step wherein an operation check, a durability check and so on for the semiconductor devices provided by step 5 are carried out. With these processes, semiconductor devices are completed and they are shipped (step 7). --

Please substitute the paragraph beginning at page 41, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

A32

-- In a moving system and a stage according to the present invention, a reaction force during acceleration or deceleration as a movable portion moves is received by a stator. The stator having the reaction force received moves, by which the reaction force is converted into a kinetic energy of the stator, whereby the stator functions as a reaction force counter. With this structure, vibration of the machine reference structure produced by the reaction force of the moving system or the stage can be prevented. Also, since the two stators move along the

a 32 conc. machine reference structure, in accordance with the acceleration of the moving element, any biased load as the moving element moves can be made small. --

Please substitute the paragraph beginning at page 41, line 18, and ending on page 42, line 4, with the following. A marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

a33 -- In accordance with an exposure apparatus having a stage described above, the influence of vibration or swinging motion resulting from the motion of the stage can be reduced, such that the overlay precision, the linewidth precision, and the throughput can be improved. Further, since the biased load as the moving element moves can be made smaller, the overlay precision can be improved. Further, because the influence of the reaction force, due to the acceleration or deceleration of the stage, can be reduced, the influence to the other machines placed on the same floor, can be made smaller. Also, enlargement of the area to be occupied by the apparatus can be prevented. --

<u>IN THE CLAIMS</u>:

Please AMEND claims 1, 3, 8, 11, 12, 16-18, 20, 21 and 24-26, and ADD new claims 28-35, as follows. A marked-up copy of the amended claims, showing the changes made thereto, is attached in Appendix A. For the Examiner's convenience, all claims currently pending in this application have been reproduced below: